Amendments to the Claims

1. (currently amended) A compass system comprising:

a 2-axis magnetic sensor ~~at least one magnetic sensor~~;

a tilt sensor;

a memory;

a processor;

at least one value for the Earth's magnetic field strength stored in the memory; and

a set of instructions stored in the memory and executable by the processor to calculate a magnetic field component, *Z*, that is orthogonal to measurement axes associated with the 2-axis magnetic sensor ~~measurement axes,~~ using inputs from the 2-axis magnetic sensor and using the at least one stored value for the Earth's magnetic field strength.

2. (canceled)

3. (currently amended) The system of claim 1 ~~2~~, wherein the ~~orthogonal~~ field component *Z* is calculated as $Z = \sqrt{H^2 - X^2 - Y^2}$ where *H* is the at least one stored value, *X* is a first measurement from the 2-axis magnetic sensor and *Y* is a second measurement from the 2-axis magnetic sensor that is orthogonal to *X*.

4. (currently amended) The system of claim 3, further comprising ~~calculating local horizontal components of theEarth's magnetic field using the calculated value of Z and inputs from the tilt sensor~~ a set of instructions in memory and executable by the processor to calculate local horizontal components of the Earth's magnetic field X_{comp} and Y_{comp} using the calculated value of Z and inputs from the tilt sensor.

5. (original) The system of claim 4, wherein the tilt sensor is a 2-axis tilt sensor that measures pitch (Φ) and roll (θ) angles and wherein the local horizontal components X_{comp} and Y_{comp} are mutually orthogonal and are calculated using the equations;

$$X_{comp} = X\cos\Phi + Y\sin^2\Phi - Z\cos\theta \sin\Phi \quad \text{and}$$

$$Y_{comp} = Y\cos\theta + Z\sin\theta.$$

6. (original) The system of claim 5, wherein a compensated heading is calculated using the equation

$$Heading = arcTan(Y_{comp} / X_{comp}).$$

7. (currently amended) A method of compensating for tilt in an electronic compass having a 2-axis magnetic sensor and a tilt sensor, the method comprising:

storing at least one value for the Earth's magnetic field strength;

measuring the Earth's magnetic field strength with the 2-axis magnetic sensor; and

calculating a magnetic field component, Z, that is orthogonal to the measurement axes associated with the 2-axis magnetic sensor ~~measurement axes,~~ using the measured field

strengths from the 2-axis magnetic sensor and using the at least one stored value for the Earth's magnetic field strength.

8. (original) The method of claim 7, further comprising:

calculating the orthogonal field component Z using the equation $Z = \sqrt{H^2 - X^2 - Y^2}$ where H is the at least one stored value, X is a first measurement from the 2-axis magnetic sensor and Y is a second measurement from the 2-axis magnetic sensor that is orthogonal to X.

9. (original) The method of claim 8, further comprising:

calculating local horizontal components X_{comp} and Y_{comp} of the Earth's magnetic field using the calculated value of Z and inputs from the tilt sensor, wherein the tilt sensor is a 2-axis tilt sensor that measures pitch (Φ) and roll (θ) angles and wherein the local horizontal components X_{comp} and Y_{comp} are mutually orthogonal and are calculated using the equations;

$X_{comp} = X\cos\Phi + Y\sin^2\Phi - Z\cos\theta \sin\Phi$ and

$Y_{comp} = Y\cos\theta + Z\sin\theta$.

10. (original) A method of compensating for tilt in an electronic compass having a 2-axis magnetic sensor and a tilt sensor, the method comprising:

storing at least one value for the Earth's magnetic field strength;

measuring the Earth's magnetic field strength with the 2-axis magnetic sensor;

calculating a magnetic field component, Z, that is orthogonal to the 2-axis magnetic sensor measurement axes using the measured field strengths from the 2-axis magnetic sensor and using the at least one stored value for the Earth's magnetic field strength, wherein the orthogonal field component Z is calculated using the equation $Z = \sqrt{H^2 - X^2 - Y^2}$ where H is the at least one stored value, X is a first measurement from the 2-axis magnetic sensor and Y is a second measurement from the 2-axis magnetic sensor that is orthogonal to X;

calculating local horizontal components X_{comp} and Y_{comp} of the Earth's magnetic field using the calculated value of Z and inputs from the tilt sensor, wherein the tilt sensor is a 2-axis tilt sensor that measures pitch (Φ) and roll (θ) angles and wherein the local horizontal components X_{comp} and Y_{comp} are mutually orthogonal and are calculated using the equations;

$X_{comp} = X\cos\Phi + Y\sin^2\Phi - Z\cos\theta \sin\Phi$ and

$Y_{comp} = Y\cos\theta + Z\sin\theta$; and

calculating a compensated heading using the equation

$Heading = arcTan(Y_{comp} / X_{comp})$.